

PENT COOPERATION TREA

PCT
NOTIFICATION OF ELECTION
(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 01 November 2000 (01.11.00)	
International application No. PCT/SE00/00089	Applicant's or agent's file reference W 1505-069
International filing date (day/month/year) 18 January 2000 (18.01.00)	Priority date (day/month/year) 18 January 1999 (18.01.99)
Applicant TYRÉN, Carl	

1. The designated Office is hereby notified of its election made:

in the demand filed with the International Preliminary Examining Authority on:

08 August 2000 (08.08.00)

in a notice effecting later election filed with the International Bureau on:

2. The election was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Manu Berrod
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REC'D 13 MAR 2001

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference W 1505-069 BA/vo	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00089	International filing date (day/month/year) 18/01/2000	Priority date (day/month/year) 18/01/1999	
International Patent Classification (IPC) or national classification and IPC G01V15/00			
Applicant RSO CORPORATION N.V. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 4 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			

Date of submission of the demand 08/08/2000	Date of completion of this report 09.03.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel: +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Passier, M Telephone No. +49 89 2399 2178



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/SE00/00089

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

Description, pages:

1-3,5-12	as published
4	with telefax of
	13/02/2000

Claims, No.:

1-13	with telefax of	13/02/2000
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Drawings, sheets:

1/4-4/4	as published
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/SE00/00089

- the description, pages:
 the claims, Nos.:
 the drawings, sheets:
5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)
6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/SE00/00089

Re Item V

1. Prior Art

The following documents are cited in the international search report and are referred to in this communication:

- D1: US-A-4 350 883
- D2: US-A-4 571 592
- D3: US-A-4 982 158
- D4: US-A-4 048 558

2. Technical Field

The invention relates to an article identification tag and a method of identifying it.

3. Novelty and Inventive Step (Articles 33(1)-(3) PCT)

- 1. The independent **claims 1 and 8** meet the novelty and inventive step requirements of the PCT for the following reasons:
 - 2. Document D1, which is considered to represent the most relevant state of the art, discloses an article identification tag comprising a plurality of electrically conductive members each of which has a unique predetermined electrical resistivity or a unique predetermined magnetic permeability. D1 also discloses a method of identifying the tag comprising the steps of causing an AC current to flow through each of the electrically conductive members, varying the frequency of the AC current and monitoring a corresponding variation in impedance of the member.
 - 3. The method of **claim 1** differs from D1 in that a discontinuity in the variation in impedance and the frequency of the AC current at which this discontinuity occurs are detected. Thereby, an alternative method of identifying a tag is achieved. The tag of **claim 8** differs from D1 in that each of the electrically conductive members has a unique predetermined diameter. By providing this alternative tag coding parameter an alternative tag is achieved.
 - 4. None of the other documents disclose or suggest the differentiating features mentioned above. D2, D3 and D4 neither deal with article identification tags nor

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with methods of identifying them.

4. Dependent Claims

The **claims 2-7 and 9-13** are dependent on claims 1 and 8 respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive step.

5. Industrial Applicability (Article 33(1),(4) PCT)

Beyond any doubt, the invention is industrially applicable.

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elements) and/or capacitive and inductive components (for the electric resonant circuit versions). Naturally, this implies a higher cost per unit. Furthermore, the codespan (number of different code values) of the multi-element tags described above is clearly inferior in comparison with optical barcode tags. Additionally, since the multi-element tags mainly operate by magnetic or inductive link, the operating distance of the detection system is quite narrow (although better than for optical barcode systems).

US-A-4 350 883 discloses a method of detecting an article identification tag having a plurality of metallic wires. Each metallic wire is selected from a range of specimens of different electric conductivity or, possibly, different magnetic permeability. The metallic wires are used as marking or coding elements to represent the code or identity of the tag. When detecting the tag in US-A-4 350 883, the wires are exposed to a high-frequency electromagnetic field, the frequency of which is varied either between two distinct frequencies or continuously. A variation in a corresponding response signal is picked up.

Summary of the Invention

Therefore, an object of the present invention is to provide an article identification tag at a considerably lower cost than previously known tags. More specifically, the invention aims at providing a tag, which combines the good characteristics of optical barcode tags (large code span) and non-optical multi-element tags (long operating distance) at a very low price per tag.

It is a further object of the invention to provide a method of detecting an article identification tag according to the above.

The objects of the invention have been achieved through the inventive understanding that basically any electrically conductive material can be used as material for the sensor elements of the tag, thanks to the novel detection method according to one aspect of the invention. For instance, a piece of copper or aluminium wire will make an excellent tag. Alternatively, magnetic materials such as simple iron or steel wires may be used.

The objects of the invention are achieved by the appended independent patent claims. Other objects, features and advantages of the present invention will also appear from the following detailed disclosure, from the drawings as well as from the subclaims.

CLAIMS

1. A method of detecting an article identification tag (30) having at least one electrically conductive member (31-3n), wherein, for each of said at least one member (31-3n), an alternating electric current is caused to flow through said member, a frequency of the alternating electric current is varied, and a corresponding variation in impedance of said member is monitored, characterized by
5 the steps of
 - detecting a discontinuity in said variation in impedance; and
 - detecting the frequency of the alternating electric current, at which frequency said discontinuity appears.
- 15 2. A method according to claim 1, wherein each of said at least one electrically conductive member (31-3n) has one of a predetermined diameter, a predetermined electrical resistivity or a predetermined magnetic permeability, and wherein said predetermined diameter, resistivity or permeability is mapped to information about an identity of the tag (30).
- 25 3. A method as in claim 1 or 2, wherein the alternating electric current is induced in said at least one electrically conductive member (31-3n) by exposing the tag (30) to an alternating electromagnetic field.
- 30 4. A method as in any preceding claim, wherein the alternating electric current is induced in said at least one electrically conductive member (31-3n) by exposing the tag (30) to a magnetic field.

5. A method as in any preceding claim, wherein said at least one electrically conductive member (31-3n) is an elongated metallic member having the form of a wire, strip or ribbon.

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6. A method as in claim 5, wherein the elongated magnetic member (31-3n) comprises a non-magnetic metal, preferably copper or aluminium.

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7. A method as in claim 5, wherein the elongated metallic member comprises a magnetic material, preferably iron, steel or an amorphous metal alloy.

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8. An article identification tag (30) comprising a plurality of electrically conductive members (31-3n), characterized in that each of the electrically conductive members (31-3n) has a unique predetermined diameter.

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9. A tag as in claim 8, wherein the electrically conductive members (31-3n) are formed as metallic wires, strips or ribbons.

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10. A tag as in claim 9, wherein the metallic wires, strips or ribbons (31-3n) comprise a non-magnetic metal, preferably copper or aluminium.

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11. A tag as in claim 9, wherein the metallic wires, strips or ribbons comprise a magnetic material, preferably iron, steel or an amorphous metal alloy.

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12. A tag as in any of claims 8 to 11, wherein at least some of the electrically conductive members (35, 36) have galvanic contact with each other.

13. A tag as in any of claims 8 to 12, wherein the electrically conductive members (34) are formed by an elongated element having sections of different diameters.

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ANNEXES

elements) and/or capacitive and inductive components (for the electric resonant circuit versions). Naturally, this implies a higher cost per unit. Furthermore, the codespan (number of different code values) of the multi-element 5 tags described above is clearly inferior in comparison with optical barcode tags. Additionally, since the multi-element tags mainly operate by magnetic or inductive link, the operating distance of the detection system is quite narrow (although better than for optical barcode systems).
10

Summary of the Invention

Therefore, an object of the present invention is to provide an article identification tag at a considerably lower cost than previously known tags. More specifically, 15 the invention aims at providing a tag, which combines the good characteristics of optical barcode tags (large code span) and non-optical multi-element tags (long operating distance) at a very low price per tag.

It is a further object of the invention to provide a 20 method of detecting an article identification tag according to the above.

The objects of the invention have been achieved through the inventive understanding that basically any 25 electrically conductive material can be used as material for the sensor elements of the tag, thanks to the novel detection method according to one aspect of the invention. For instance, a piece of copper or aluminium wire will make an excellent tag. Alternatively, magnetic materials such as simple iron or steel wires may be used.
30

The objects of the invention are achieved by the appended independent patent claims. Other objects, features and advantages of the present invention will also appear from the following detailed disclosure, from the drawings as well as from the subclaims.

CLAIMS

1. A method of detecting an article identification tag (30) having at least one electrically conductive member (31-3n), **characterized** by the steps, for each of said at least one member (31-3n), of:
 - causing an alternating electric current to flow through said member;
 - varying a frequency of the alternating electric current;

10 monitoring a corresponding variation in impedance (R_{eff}) of said member;

detecting a discontinuity in said variation in impedance; and

15 detecting the frequency of the alternating electric current, at which frequency said discontinuity appears.

2. A method according to claim 1, wherein each of said at least one electrically conductive member (31-3n)
20 has one of a predetermined diameter ($\phi_1-\phi_n$), a predetermined electrical resistivity ($\rho_1-\rho_n$) or a predetermined magnetic permeability ($\mu_{r1}-\mu_{rn}$), and wherein said predetermined diameter, resistivity or permeability is mapped to information about an identity of the tag (30).

25

3. A method as in claim 1 or 2, wherein the alternating electric current is induced in said at least one electrically conductive member (31-3n) by exposing the tag (30) to an alternating electromagnetic field.

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4. A method as in any preceding claim, wherein the alternating electric current is induced in said at least one electrically conductive member (31-3n) by exposing the tag (30) to a magnetic field.

5. A method as in any preceding claim, wherein said at least one electrically conductive member (31-3n) is an elongated metallic member having the form of a wire, strip or ribbon.

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6. A method as in claim 5, wherein the elongated magnetic member (31-3n) comprises a non-magnetic metal, preferably copper or aluminium.

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7. A method as in claim 5, wherein the elongated metallic member comprises a magnetic material, preferably iron, steel or an amorphous metal alloy.

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8. An article identification tag (30) comprising a plurality of electrically conductive members (31-3n), characterized in that each of the electrically conductive members (31-3n) has one of a unique predetermined diameter ($\phi_1-\phi_n$), a unique predetermined electrical resistivity ($\rho_1-\rho_n$) or a unique predetermined magnetic permeability ($\mu_{r1}-\mu_{rn}$).
20

9. A tag as in claim 8, wherein the electrically conductive members (31-3n) are formed as metallic wires, strips or ribbons.

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10. A tag as in claim 9, wherein the metallic wires, strips or ribbons (31-3n) comprise a non-magnetic metal, preferably copper or aluminium.

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11. A tag as in claim 9, wherein the metallic wires, strips or ribbons comprise a magnetic material, preferably iron, steel or an amorphous metal alloy.

12. A tag as in any of claims 8 to 11, wherein at least some of the electrically conductive members (35, 36) have galvanic contact with each other.

5 13. A tag as in any of claims 8 to 12, wherein the electrically conductive members (34) are formed by an elongated element having sections of different diameters ($\phi_1 - \phi_n$) .